PATENT COOPERATION TREATY

REC'D 05 OCT 2004

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PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

11 JAN 2005

Applicant's or agent's file reference TS 5580 PCT	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/EP 03/06761	International filing date *(day/month/year)* 25.06.2003	Priority date *(day/month/year)* 12.07.2002
International Patent Classification (IPC) or both national classification and IPC C10G45/64		
Applicant SHELL INTERNATIONALE RESEARCH MAATS... et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 5 sheets.

EPO - DG 1

12. 11. 2004

(52)

3. This report contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
11.02.2004	04.10.2004
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Harf, J Telephone No. +49 89 2399-7845

Form PCT/IPEA/409 (Cover Sheet) (January 2004)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP 03/06761

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1, 3-19	as originally filed
2, 2a	received on 14.07.2004 with letter of 14.07.2004

Claims, Numbers

1-13	received on 14.07.2004 with letter of 14.07.2004

Drawings, Sheets

1/1	as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☐ the claims, Nos.:

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-13
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-13
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-13
	No:	Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:
D1: WO-A-0250213
D2: WO-A-0015736

The document **D2** (claim 1; figure; Example 3, Tables 1 and 2), which is regarded as being the closest prior art to the subject-matter of independent claim 1, discloses a process to prepare a wide-cut lubricant base stock having a kinematic viscosity of 24.89 cSt at 100°C and a pour point of -14°C by catalytic dewaxing of the waxy 700°F+ Fischer-Tropsch derived hydroisomerate having 20 wt-% boiling above 529°C with a Pt/H-Mordenite catalyst and rough flashing of the dewaxate to remove lighter components from the wide-cut base stock.

The subject-matter of claim 1 differs from this known process in that the partly isomerised Fischer-Tropsch derived feedstock contains at least 20 wt-% of a fraction boiling above 540°C, in that this feedstock is separated into a light and a heavy base oil precursor fraction and in that both base oil precursor fractions are separately dewaxed to simultaneously produce a light and a heavy lubricating base oil.

The subject-matter of independent claim 1 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as to provide a process for simultaneously preparing a heavy base oil and a light base oil from an isomerised Fischer-Tropsch derived feedstock.

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

Document **D1** (claims 1,2 and 4-6; figures 1 and 2) discloses a process to prepare three base oil grades comprising the separate catalytic dewaxing of a spindle oil (3.5-5.5 cSt@100°C), a light machine oil (6.5-9 cSt@100°C) and a medium machine oil (10-13.5 cSt@100°C) fraction obtained in a hydrowax vacuum distillation carried out in two alternating modes, wherein the hydrowax is a bottoms fraction of a combined fuels hydrotreatment and hydrocracking process.

Both the hydrowax feed and the resulting base oil fractions disclosed in D1 are different from the isomerised Fischer-Tropsch derived feedstock and the two base oil fractions of the present invention.

There is no indication in the available prior art that would lead the skilled person to modify the process of D2 or D1 and achieve the subject-matter of independent claim 1, i.e. the simultaneous preparation of a heavy base oil having a kinematic viscosity at 100°C of above 15 cSt and a light base oil having a kinematic viscosity at 100°C of between 3.8 and 6 cSt starting from a partly isomerised Fischer-Tropsch derived feedstock by distillation of the isomerate into a light and a heavy base oil precursor fraction, separate dewaxing of both precursor fractions and isolation of the two base oil products.

Claims 2-13 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

116 A disadvantage of the process as described above is that it has been found difficult to prepare the high viscosity product at all or in a sufficient quantity.

The object of the present invention is to provide a process, which can prepare at least a light and a heavy base oil.

The following process achieves this object. Process to prepare a heavy base oil having a kinematic viscosity at 100 °C of above 15 cSt and a light lubricating base oil having a kinematic viscosity at 100 °C of between 3.8 and 6 cSt from a partly isomerised Fischer-Tropsch derived feedstock, said feedstock having an initial boiling point of below 400 °C and a final boiling point of above 600 °C and the fraction boiling above 540 °C is at least 20 wt% by

(a) separating, by means of distillation , said fraction into a light base oil precursor fraction and a heavy base oil precursor fraction,

(b) reducing the pour point of each separate base oil precursor fraction by means of dewaxing,

(c) and isolating the desired base oil products from said dewaxed oil fractions as obtained in step (b).

Applicants have found that with the process according to the invention highly saturated base oils containing almost no sulphur and having a high viscosity index can be prepared. Furthermore different base oil grades may be prepared using this process, ranging from the low viscosity grades to the high viscosity grades. For example a base oil product slate, wherein the different products have kinematic viscosities at 100 °C of about 2, 5, 8.5 and 20 cSt respectively may be prepared in a high yield. A further advantage of dewaxing the light and heavy base oil precursor fractions separately is that the

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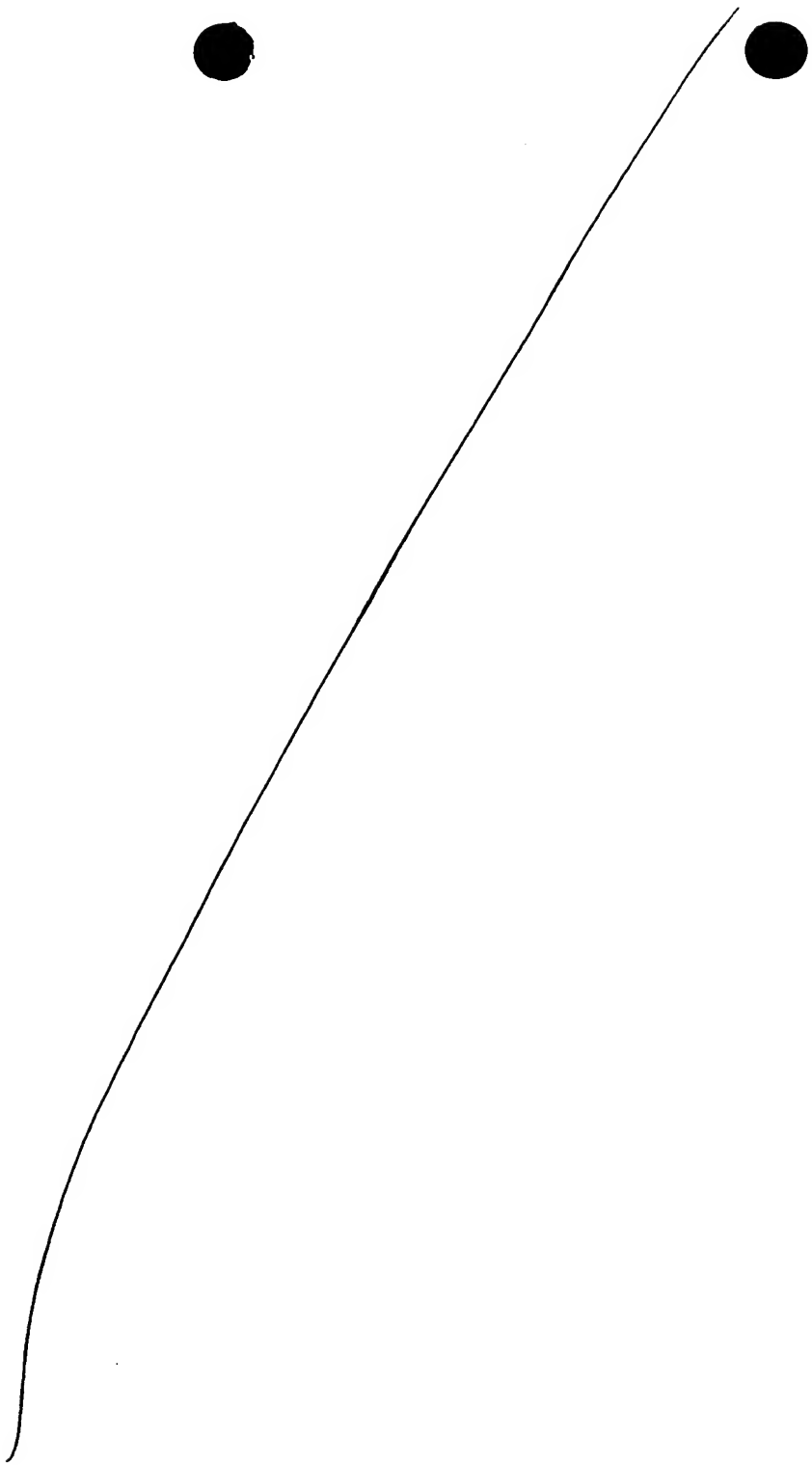

pour points of the resulting light and heavy base oils can be targeted to their most optimal

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NEW SET OF CLAIMS

1. Process to prepare a heavy base oil having a kinematic viscosity at 100 °C of above 15 cSt and a light lubricating base oil having a kinematic viscosity at 100 °C of between 3.8 and 6 cSt from a partly isomerised Fischer-Tropsch derived feedstock, said feedstock having an initial boiling point of below 400 °C and a final boiling point of above 600 °C and the fraction boiling above 540 °C is at least 20 wt% by

(a) separating, by means of distillation , said fraction into a light base oil precursor fraction and a heavy base oil precursor fraction,

(b) reducing the pour point of each separate base oil precursor fraction by means of dewaxing,

(c) and isolating the desired base oil products from said dewaxed oil fractions as obtained in step (b).

2. Process according to claim 1, wherein the effective cut temperature in step (a) at which the light and heavy base oil precursor fractions are separated is between 470 and 600 °C.

3. Process according to any one of claims 1-2, wherein the fraction boiling above 540 °C in the feed to step (a) is at least 30 wt%.

4. Process according to any one of claims 1-3, wherein the heavy base oil as obtained in step (c) has a kinematic viscosity at 100 °C of above 17 cSt, preferably above 20 cSt.

5. Process according to claim 4, wherein a base oil having a kinematic viscosity at 100 °C of between 7 and

15 cSt is isolated from the dewaxed light base oil precursor fraction.

6. Process according to any one of claims 1-5, wherein the dewaxing of the heavy and light base oil precursor fraction is performed simultaneously in two different reactors.

7. Process according to any one of claims 1-6, wherein the dewaxing step is performed by means of a catalytic dewaxing process in the presence of a catalyst comprising a medium pore size molecular sieve and a Group VIII metal.

8. Process according to claim 7, wherein the molecular sieve is a MTW, MTT or TON type molecular sieve.

9. Process according to any one of claims 7 or 8, wherein the Group VIII metal is platinum or palladium.

10. Process according to any one of claims 7-9, wherein the catalyst used in the catalytic dewaxing of the heavy base oil precursor fraction comprises a MTW molecular sieve, platinum or palladium as Group VIII metal and a silica binder.

11. Process according to claim 10, wherein the catalytic dewaxing of both light and heavy base oil precursor fractions are performed in the presence of a catalyst comprising a MTW molecular sieve, platinum or palladium as Group VIII metal and a silica binder.

12. Process according to any one of claims 1-6, wherein the heavy base oil precursor fraction is reduced in pour point by first performing a pour point reducing step in the presence of a catalyst comprising a 12-member ring zeolite and secondly performing a catalytic dewaxing on the effluent of the first step in the presence of a 10-member ring zeolite.

13. Process according to claim 12, wherein the pour point after the first dewaxing step is between -10 and +10 °C.

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